

NANOSCALE ORDERED COMPOSITES OF COVALENT CERAMICS FOR
HIGH-TEMPERATURE STRUCTURAL APPLICATIONS VIA BLOCK-
COPOLYMER-ASSISTED ASSEMBLY AND METHOD OF MAKING

ABSTRACT OF INVENTION

[0036] A method of making nanoscale ordered composites of covalent ceramics through block copolymer-assisted assembly. At least one polymeric precursor is mixed with a block copolymer, and self-assembly of the mixture proceeds through an annealing process. During the annealing step, the polymeric precursor cross-links to form a structure robust enough to survive both the order-disorder transition temperature the block copolymer and the pyrolysis process, yielding ordered nanocomposites of high temperature ceramic materials. The method yields a variety of structures and morphologies. A ceramic material having at least one ceramic phase that has an ordered structure on a nanoscale and thermally stable up to a temperature of at least about 800°C is also disclosed. The ceramic material is suitable for use in hot gas path assemblies, such as turbine assemblies, boilers, combustors, and the like.